# AMERICAN ELECTRO-PLATERS SOCIETY

(An Educational Society)

Chartered 1909

# MONTHLY REVIEW

MAY, 1916

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EDITORIAL STAFF.

H. J. RICHARDS, *Editor.*
6230 Berthold Avenue,
St. Louis, Mo.

*Associate Editors*

W. S. BARROWS, Toronto, Ont.
H. E. WILLMORE, Chicago, Ill.
GEORGE B. HOGABOOM, New Britain, Conn.
C. H. PROCTOR, Arlington, N. J.
HARRY DE JOANNIS, Bridgeport, Conn.
OSCAR E. SERVIS, Chicago, Ill.
JOSEPH WALTERS, Richmond, Va.
H. J. TER DOEST, Akron, Ohio.

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A great deal of the information we possess comes from others. Why not return some of it with interest?

# MONTHLY REVIEW

American Electro-Platers' Society

(An Educational Society)

Vol. 3 MAY No. 5


## EDITORIALS

By Joseph Walters, Richmond, Va.

In a few more weeks our society will end another year of a successful existence. In comparing our former publications to the present one I venture the assertion that not a single member who has helped make our present Review, but feels a sense of pride and satisfaction in having been a part and parcel in its progressive development. Is it not better with each year? Almost every issue is better than the last.

Does it not compare favorably with other technical or trade journals? Of course now and then errors and misinformation creeps into its pages.

But what publication is perfect? I and many others would much rather have a monthly visit by our Review with articles in the language of a plater, that all can understand, than a strictly technical journal once a year.

And "if failures are stepping stones to success," then the occasional mistakes in the improper presentation of facts should be foundation walls of efficiency. We learn from the mistakes of others. A child learns to creep before it can walk. Our growth has been healthy and steady.

A gradual development is better than a revolutionary change. Personally I am proud of its make up, proud and glad and thankful for information it gives me, and last, but not least, I am glad that I am one of the few who is responsible for the improvement of our Review.

I know things others don't know. Others know things I don't know. We get more valuable knowledge in electro-plating from our Review than can possibly be had from any other source.

The only regrettable incident connected with it is the fact that out of a membership of several hundred only a dozen or so are regular contributors. Haven't you realized the fact if all who can would write of their experiences and knowledge, our Review would contain information in one month's issue that now takes a year to acquire?

The more contributors the more and sooner will we learn.

And will you pardon a suggestion or two? We are interested in electro-plating, it is true, but we are also interested in the electro-plater and his family.

Can't we have a page devoted to personals?

And the other suggestion is: I believe it would benefit our

society immensely if a month or two before our national convention we would publish a special edition, a "Business Issue," containing special articles, and send one to every firm employing a member of our society.

(The idea is a good one. The attention of employers to the importance and value of having their platers attend the convention should be presented in an adequate manner by the A. E. S. If anything of that kind can be done, I will further it heartily.—Ed.)

## THE CLEVELAND CONVENTION.

By The Editor.

Oh, listen, my children, and you shall hear
About the Convention at Cleveland this year;
For Cleveland City has gotten the cake—
Beautiful Cleveland on the Lake.
There we will gather in convocation
And further our plating education,
And platers will gather the wisest and best
From North, from South, and from East and from West.
Electricians, metallurgists, chemists, and platers,
The best in the land and the best educators.
We will gather in council for hours at a time
And learn some more about nickel slime.
I'm not kidding: I tell you, the time it is rife—
If you miss this Convention, you miss half your life.
Our leaders in counsel will then be elected,
The wisest and bestest that can be selected.
Some new useful laws will no doubt be enacted
And laws of no value will there be extracted.
Through Cleveland's fine parks a ride we will take
And enjoy our annual bath in the lake;
Once again we will meet at the banqueting table
And enjoy the good eats just as much as we're able.
Old friends we will meet and their hands we will take
And many new friends this Convention will make.
So start to get ready—the time goes by swift—
And meet me at Cleveland next July the fifth.

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Mr. Williams called us up about three weeks ago and challenged us to a swimming race at Edgewater Park next July. This was the first intimation we had that the next Convention will be at Cleveland. We hail the news with joy. We now expect to get even for them three games of pool we lost at Dayton last year.—[Ed.

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Let your light shine before the A. E. S., or we may come to the conclusion that you have no light.

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One square deal is worth a thousand ideals.

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Honesty is the best policy. Never allow it to lapse.

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# VOLUMETRIC DETERMINATION OF NICKEL.

By HAROLD W. FAINT, Newark Branch.

The principle used in this determination has been applied to alloys of nickel with satisfactory results, so the author has tried and found its application to determinations of nickel in a plating bath. In slightly ammoniacal solution the nickel will form a complex anion [Ni $(CN)_4$] upon addition of an excess of potassium cyanide. A difficulty here presents itself in that it is difficult to tell exactly when enough KCN has been added. To get a satisfactory end point, silver nitrate and potassium iodide are added, giving a yellowish, murky color to the solution, this disappearing upon adding one drop of KCN solution. The reactions are here listed in the order in which they occur:

$Ni\ SO_4 + 6\ NH_4OH = Ni\ (NH_3)_6\ SO_4 + 6\ H_2O.$

$AgNO_3 + KI = KNO_3 + AgI.$

$Ni\ (NH_3)_6\ SO_4 + 4\ KCN = K_2\ Ni\ (CN)_4 + K_2\ SO_4 + 6NH_3.$

$AgI + 2\ KCN = KAg(CN)_2 + KI.$

This method of determining nickel is not interfered with by iron, manganese, chromium and zinc. Also several rare metals do not interfere with the reaction.

The largest consumption of time is in preparing the standard solutions. This will take from one and a half hours to six, depending upon the apparatus, chemicals at hand, and the individual.

A tenth normal $AgNO_3$ solution contains 16.989 grams of pure $AgNO_3$ per liter. To make this solution, weigh out accurately on the balance the pure salt and put it in a 1000 cc. flask and dilute to the mark with distilled water.

A solution of potassium cyanide, corresponding in strength to the $AgNO_3$ solution, is prepared by dissolving 13.5 grams of the pure KCN in a liter of water, adding to it about 4 to 5 grams of pure KOH as a preservative. This solution must be standardized, i. e., the grams per cc. of KCN in this solution must be accurately determined.

The KI solution is prepared by dissolving 2 grams of the pure salt in 100 cc. of water. This is called a 2% KI solution.

To standardize the KCN solution: Two 50 cc. burettes are necessary, one for KCN, the other for $AgNO_3$. To a beaker containing about 100 cc. of $H_2O$ is added from the KCN burette about 20 cc. and then about 5 cc. of KI solution. Into the beaker containing this material some of the $AgNO_3$ solution is allowed to run from the burette until a drop causes a permanent murky or opalescent color to the solution in the beaker. One drop of KCN solution should discharge the murky color, giving a clear solution. From the cc. used of each solution we can get the grams of KCN per cc. to the original solution and the ratio $\frac{\text{cc. KCN}}{\text{cc. } AgNO_3}$ used in computing the amount of nickel.

$$\text{Cc. } AgNO_3 \text{ used} \times \text{grams } AgNO_3 \text{ per cc.} \times \frac{2\ KCN}{AgNO_3}$$

$$\times \frac{1}{\text{cc. KCN used}} = \text{grams KCN per cc.}$$

$$\frac{\text{cc. KCN}}{\text{cc. } AgNO_3} = \text{the ratio R.}$$

To make certain that the standardization is accurate, the determination should be repeated until you get consistent results. These solutions having once been prepared and standardized, they should be put in glass-stoppered bottles and kept covered. These solutions are now ready for the actual analysis of the nickel-plating baths at any time desired.

The analysis requires a 10 cc. pipette to obtain the sample. Until well accustomed to doing this analysis, always do a duplicate as a check unless time does not permit. This actual analysis should require but five or six minutes at the slowest rate.

Stir the bath well to obtain a uniform sample and remove in a clean glass beaker about a pint of the bath from the tank. Take to laboratory or wherever the burettes and solutions stand. Using pipette, deliver 10 cc. of the bath into another beaker, dilute with $H_2O$ to about 100 or 150 cc. and test it for acidity with litmus. Add a small amount of $NH_4OH$ until ammoniacal. Add from $AgNO_3$ burette about ½ cc. of the solution of $AgNO_3$ and about 5 cc. of KI solution. This gives a yellowish ppt. of AgI. Now KCN solution is allowed to run into the beaker slowly and carefully until the whole precipitate and murkiness clears up. Then add drop by drop from $AgNO_3$ burette enough to get a slight cloudiness. Then one drop from the KCN burette will discharge the opalescence. Immediately read the burette and note the cc. used of KCN and $AgNO_3$. From this data and the standardization we can compute the amount of nickel present.

The complete statement of the calculation is somewhat involved, but after using it once the numerical values will simplify the expression.

$$\left[\text{cc. KCN} - \text{cc. } AgNO_3 \times \frac{\text{cc. KCN}}{\text{cc. } AgNO_3}\right] \times \text{grams of KCN per cc.} \times \frac{\text{Ni}}{4\ \text{KCN}} \times \frac{1}{\text{cc. sample}} \times \frac{3780\ \text{cc.}}{28.35\ \text{g.}} = \text{oz. per gallon.}$$

Substituting G for the grams of KCN per cc., R for the $\frac{\text{cc. KCN}}{\text{cc. } AgNO_3}$ and the molecular weights above indicated, we get

$$\left(\text{cc. KCN} - \text{cc. } AgNO_3 \times G \times \frac{58.68}{4 \times 65.11} \times \frac{1}{10\ \text{cc.}}\right) \times \frac{3780}{28.35} = \text{oz. Ni per gallon.}$$

When G and R have been determined in the standardization, the expression $G \times \frac{58.68}{4 \times 65.11} \times \frac{1}{10} \times \frac{3780}{28.35}$ gives a single number such as P. The final computation becomes

(cc. KCN—cc. $AgNO_3 \times R) \times P$=ounces of nickel per gal.

When the standard tenth normal $AgNO_3$ solution and KCN solution have been exhausted, new values of R, G and P must be determined by standardization as above described. If the plater expects to analyze the nickel bath frequently, it would be best to make up 5 or 10 liter solutions, using the proper increase in materials. Two 50 cc. pipettes are convenient for transferring the standard solutions to the burettes.

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## ACID COPPER SOLUTION.

By Chas. Werft, Cleveland Branch.

At our last meeting I was asked to have a paper on acid copper. This solution is the simplest to make of all the plating solutions that a plater is called upon to make, and a solution that is not hard to "run."

What I have written here will be, no doubt, cause for dispute, but where there is a variety of opinion, points are brought out in the discussion that would ordinarily be overlooked.

This solution is made with the sulphate of copper 1¾ pounds to a gallon, and sulphuric acid 2 ounces. Copper can be deposited with sulphate of copper alone after it is electrolized, and the ammeter will show a reading and a deposit of copper can be obtained.

This solution without the sulphuric acid should stand 15 degrees Be. Now if the sulphuric acid is added till the hydrometer reads 18 degrees Be. we will have a finer and better deposit, proving that sulphuric acid is a good conductor, and necessary in a copper sulphate solution.

When a solution of copper sulphate and sulphuric acid is made, and the whole electrolized, the sulphuric acid furnishes so many sulphate radicals to combine with the copper that is liberated from the anodes; that so much more copper is deposited from the solution, than if copper sulphate alone were used; this copper sulphate is the real conducting power.

In passing I might state that a radical is the base of a chemical compound; in this instance, the radicals of this solution are of course copper.

A solution that stands 21 or 22 degrees Be. will have a higher temperature, and will require a higher current density than a solution that stands 18 or 19 degrees Be.; the solution with the high temperature and 21 degrees Be. will have a deposit that is brittle, unless we use a current density from 75 to 85 amperes per square foot. When the temperature is not higher than 75 degrees F. the deposit is tough, and brittle, the current density, of course, is not so high; it should not be over 50 amperes per square foot.

A solution that has a large amount of free sulphuric acid will

have a higher temperature than a solution with not so much free acid.

The amount of free sulphuric acid in the solution will depend on the class of work that is to be plated, and current density. I do not think it necessary to carry more than 6 or 7 ounces of free acid in the solution. When there is a higher per cent of free acid, an agitator will have to be resorted to to to produce a smooth deposit, as the free acid has a tendency to cause the deposit to plate rough and pebbled.

In speaking of an agitator a lead pipe full of small holes with air forced through, placed near the bottom of the tank, the air bubbles rise to the top of the solution and keeps the solution constantly moving. Care must be taken that the bottom of the tank is not stirred with the air, as the solution will be full of dirt that comes from the anodes in a black smut, and the dust from the room that settles on the surface of the solution, which will eventually plate on the work. Another form of an agitator is the moving cathode rod, but personally I prefer the air agitator. In speaking of the black smut that forms on the anodes, while work is being plated, is to my mind the impurities in the anode. The addition of one ounce of white dextrin to a gallon will overcome this trouble, or by thoroughly stirring the solution every night after the last batch of work is run, the stirring will wash this smut off the anodes and by the next morning this smut will be settled to the bottom of the tank. The first question a plater will ask is, Why stir the solution at all, especially when it is agitated all day? In agitating a solution with the air the solution is not stirred so forcibly as to wash this smut off the anodes.

## MAKING OUR WAY.

How many of us pass our time in waiting for life to give us something instead of trying to find it for ourselves! We even go so far as to think that life owes us always more than we receive, that we fulfill our mission on earth by simply living a harmless existence and that fame and fortune should be ours by right. It is for this latter reason that we so often resent the good fortune of others and allow ourselves to believe that we have been discriminated against by Providence. We do not seem to realize that it is well worth our while to do something more than wait for what may or may not come to pass, that we are the architects in large measure of our own success and that we must make the best of what is before us in order to learn the rights to fulfill the desires of our hearts. If we make but little headway we are quick with our excuses and are always ready to place the blame upon others who can in no way be held responsible. If, on the other hand, we do succeed, it seems quite natural to take the credit ourselves, whether we deserve it or not. The chances are, however, that if we amount to very much in this world, the credit belongs to us more than to anyone else, even though we do receive assistance at times from those who take an interest in us. The point of the matter is that we must fortify ourselves to meet conditions as they come and to do our best to shape them into happiness and prosperity for ourselves.

## A PLATER'S REVERIE.

By Henry Baum, Cincinnati Branch.

Whenever we do feel inspired to do something in particular and right, as a matter in fact we do consult ourselves first upon the question whether it may be feasible or not to investigate matters more correctly that will give us a license to be understood, and so in return a reaction of all things takes place, both congenial and dissenting and agreeing to mess up things conversely, wherein we must collect our thoughts together from experience, and so enter some kind of a muse or reverie. Ever since I have written "Slime in Nickel Solutions," I have given myself over to the subject as a matter of deep thought as I wish to explain a few facts from a technical standpoint of view which is put together as far as the plater in concerned the most striking kind of repose and reverie, but come down again with me where atoms and molecules reside, and thus enter their abode and so pass through their hallways with grace in deep thought and reverie and so enter their infinite chambers where an evolution of things does arise, which belongs to our art whose fundamental laws, science has caused to be so keenly observed. Let us climb up and down their hypothetical ladders, hydroplanes, stairways and slides, where atoms and molecules descend and climb. Can this be so for anodes and cathodes are versus the same, and electricity passes through them directly and swiftly, it breaks up their little cells to perform their functional duties. Their decomposition giving rise to another order of things and those elements termed positive are found at the negative pole, and those termed negative are found at the positive pole. Electrolytically they are so framed up to be of such an important character in their building and making up a solution, that is taking place in and about the anodes and cathodes, disintegrating to be made salifiable and so conveyed as a whole to make their proper returns again in the most satisfactory ways, and as such is the case with the rise and fall of nature's elemental things to reproduce, change or destroy, then again to reciprocate to a former state of elemental things again. For it is in this way that I am trying to make it my best endeavors to be understood, how the atoms and molecules descend and climb, for if it must needs be said how mine or your pet formulas are consistently arranged, contrary, however, the laws of Nature electrolytically will arrange it all to her best liking, not mine or yours, and there is where we do get the best results, according to their real solvents in equation. Then there are the laws of expansion and contraction to be determined, and the laws of the elements, whose atoms when they do separate or unite, to expand or contract themselves upon the surfaces of the anode and cathode sides. See! how they do act in their active nascent state, back and forth they do fly, around and around; while others are being robbed of their support or sustain another forms itself in its affinity way, thus accelerating and retarding and so to be attracted or repulsed by chemical or electrical energies, but never gives up; some are going down only to be digested to go up, others are going up to be

redigested, and then after they perform their duties completely, fall down once more again, and so preparing metals, gases, new acids and bases, oxides, floating oxides, hydrates, alkalies, liquid, solid and concrete forms, mosses, honeycombs, little valleys and hills, colors that are of an independent light and shade of various hues, and that which is at last set free to be retired is the complete result of chemical and electrical energies, so decided to be left alone and if possible can remain so forever with all of its wonderful beauty and effect. And as our minds dwell in deep thought midst all that has been reviewed of all these underlying scenes, a change of chemical and electrical action from the initiative to a final close takes place, a turbulence of waters seems to arise as the work of the electrolytes are taken out, very soon are we to grope about in utmost darkness after those red sinking acid signal lights have reversed themselves and appear to be climbing up, and the bluish green rising alkaline lights start slowly to sink down, then outside of a few reactions all seems to be inert, the sing-song of the dynamo is hushed, made silent, then it seems as if all was dark, except those few stars, those shining red and bluish green lights as signals of night, be it a success or failure, they are soon followed by their quick close of day. And thus to keep things going on correctly, these are all good and bad signs, indications showing whatever we have got to do, towards bringing out the best work from results obtained and thereby making a success of ourselves. Perhaps through hard work and study our troubles can thus become trifles and easily ended, if we but just know, what to do, and write them down upon the tablets of our past experience, which no doubt does keep a very dear school.

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## A WEEK'S EXPERIENCE.

| | |
|---|---|
| The year had gloomily begun | |
| For Willie Weeks, a poor man's | SUN. |
| | |
| He was beset with bills and dun, | |
| And he had very little | MON. |
| | |
| "This cash," said he, "won't pay my dues; | |
| I've nothing here but ones and | TUES. |
| | |
| A bright thought struck him, and he said, | |
| The rich Miss Goldbrick I will | WED. |
| | |
| But when he paid his court to her, | |
| She lisped, but firmly said, No, | THUR. |
| | |
| "Alas," said he, "then I must die!" | |
| His soul went where they say souls | FRI. |
| | |
| They found his gloves and coat and hat, | |
| And the coroner then upon them | SAT. |

## EXPERIENCE WITH THE BRIGHT DIP—SAVING THE RESIDUE.

By Jacob Hay, Danville, Ill.

*An Answer to Robt. Suman, Dayton, Ohio.*

Brass is an alloy of copper and zinc with small quantities of lead to facilitate machining and rolling, but the quantity of lead is so small that, for our purpose, it may be neglected.

The dip used was as follows:

1 lb. H N 03 (Nitric acid).

1 lb. H2 S 04 (Sulphuric acid).

2 or Na Cl (Common salt).

The common salt reacts with the sulphuric acid to form muriatic acid which in turn reacts with the nitric acid to form nascent chlorine, which is the substance in the dip that accomplishes the results. One, therefore, will not find nitrates and sulphates of copper and zinc but chlorides with small amounts, that are neglible, of oxides.

When the above dip has been used about an hour the work comes out smoky and to prevent this more sulphuric acid must be added until this trouble is rectified. At this rate the dip would soon contain a large amount of sulphuric and white spots will show up on the work; to rectify this one must add nitric acid until the white spots or pits fail to show. A good rule to remember is that:

Sulphuric acid remedies smoky appearances;

Nitric acid and salt remedies white spits and pitting.

One must continually watch the bright dip as the three ingredients are not only changing, due to the action on the metal dipped, but are reacting among themselves, necessitating addition of the different ingredients, which is governed by the appearance of the metal after being dipped.

One of the extravagant practices in the plating room is the discarding of the bright dip after it is exhausted. The discarded dip should be evaporated down as low as possible until moist and the residue dissolved in water. This is done to drive off the excess acid as heating is cheaper than neutralizing with sodium carbonate. Copper and zinc which are in solution as chlorides are precipitated with sodium carbonate. The copper and zinc are in the right proportion to add to the brass solution after being dissolved in the usual amount of cyanide.

It takes about 1¼ pounds of sodium carbonate to precipitate a pound of zinc and copper carbonate mixture and 1 pound of sodium carbonate is required to neutralize 1 pound of sulphuric acid so it is very apparent that one may save sodium carbonate by driving the acid off by heat.

If the copper and zinc carbonate mixture cannot be used at once after precipitating, it may be dried on shallow pans and kept for future use. In two years not a pound of copper or zinc carbonate was bought and a 500 gallon brass solution was maintained from the residue of a 30 gallon bright dip in which 30,000 pieces of rolled brass, 48"x½"x12 Ga. per month were dipped. Besides maintaining the solution for two years there remained 400 pounds of the copper, zinc, carbonate mixture.

## THE THIRD ANNUAL BANQUET OF BRIDGEPORT BRANCH A. E. S., MARCH 25TH, 1916.

The Bridgeport branch of the American Electro-Platers' Society, which has just reached the vigorous age of two years, broke all records for attendance and enthusiasm at its third annual banquet, which was held in the Stratfield Hotel on Saturday evening, March 25th, 1916. The committee in charge, under the able chairmanship of C. Wrytzen, had been working hard for some time previously to make this function a success, and they were fully repaid for their efforts by the large attendance which early manifested itself. A good number of members from out of town appeared in the hotel an hour or two before the time fixed for the banquet to commence. This number was soon augmented by a full number of the Bridgeport members.

A good dinner was prepared in the ballroom of the hotel and 105 members and friends soon did ample justice to the fare spread before them.

The position of toastmaster was filled by the President of the Bridgeport branch, W. G. Stratton, who first called upon Dr. F. C. Stanley to speak on the work of the Bridgeport branch.

Dr. Stanley stated that his own interest in the society had commenced with the inception of the local branch, and that for the past two years he had been trying to assist members to solve their everyday problems. In this process he considered himself to have been aided as much by the members, as he had aided them. The close association which has been possible has shown him that one does not need to go to college to obtain a scietific education, for in the hard school of shop experience, the plater has learned to experiment as scientifically and to tabulate results as correctly as a college professor. Not only in the shop are these problems studied, but even in the homes, problems are thought out and worked out, not through fear of losing a job, but because of their love of successful accomplishment, which is a thing of true education value.

This society, through the operation of its members, is able to benefit not only the individuals who belong to the society, but also their employers, as is vouched for by many manufacturers who possess plating plants. Concrete examples were furnished by the speaker, showing the value of the society to the manufacturer, and emphasizing the need of further co-operation between the electroplater, the manufacturer and the educator.

The next speaker called upon was a representative of the manufacturers, Wm. R. Webster, vice-president of the Bridgeport Brass Co., who spoke on co-operation. While the spirit of fighting is inborn in every individual, modern thought seeks to eliminate this spirit as much as possible and to substitute the word "co-operation" for "competition." The great problems of today in almost every line are being solved through this process of working together, instead of striving, and what is true of various firms, is true of various departments, or individuals of the same firm. The members of the craft who assist and co-operate with one another, in their turn would be helped by this co-operation. No one person is big enough in his business to keep all his knowledge to himself, but it is rather the big man who is willing to learn through others. Mr. Webster's

remarks were deeply appreciated, as an indication of the interest which manufacturers are beginning to take in this truly educational society.

For an organization whose motto is: "Education Our Aim," it was fitting that the next speaker should be the head of Bridgeport's educational system, namely, S. J. Slawson, Superintendent of Schools. Mr. Slawson stated that while not exactly an electroplater, he had been engaged in the process of plating or veneering for the past 25 years in the process of educating future citizens. He agreed that a college education was not absolutely necessary, for the following up of a trade by practical application is a true education in itself. One of the great problems of the present-day educator is to decide whether a pupil is equipped to preach or to plant corn and the solution of this problem means the difference between the education of the college and the education of the factory. In concluding his remarks, Mr. Slawson welcomed the electroplaters of the city to see him at any time with regard to matters concerning the education of their children.

George B. Hogaboom, Meriden, Conn., was next called upon by the chairman and responded as usual with an interesting speech, pointing out the early struggles of the society and its present condition. The electroplater of today is very different from the early members of the craft, who usually had a few cherished secrets which they guarded like misers. Under those early conditions progress of the art could not be rapid, and the modern developments of electroplating are the more remarkable under the circumstances. With the American Electro-Platers' Society established, and through the attitude which it has produced amongst the modern electroplaters, its status has progressed from that of a trade to that of a profession which is advancing rapidly. Not only are its members working out new methods and solutions, but they are studying the essentials of their work, making chemical laboratories to test out their solutions. Today the plater is learning to approach the college man, the teacher, or professor, and is finding benefit from the contract and the new ideas produced thereby.

Mr. Hogaboom also touched on the necessity for the plater and the manufacturer to work together, as it means so much, not only to the plater, but also to his employer. As a past president of the Supreme Society, the speaker complimented the Bridgeport branch on their excellent showing, in spite of it being one of the youngest branches in the country.

The last speaker of the evening was the founder of the Society, Charles H. Proctor of New York, whose theme was also co-operation. The United States is destined to lead the world in industries and in order to accomplish this there must be a steady advancement of every trade and profession in the country. For this purpose there is a necessity for unity of action and aim between the employer and his employes, and one of the great aims of the American Electroplaters' Society is to bring about this closer co-operation by means of education.

The banquet finished at 10:30 p. m., after which many acquaintances and friendships were renewed, amid references to the remarkable change from the old time Connecticut electroplater to the up-to-date member of the Bridgeport branch.

## SOME UNSOLVED PROBLEMS OF THE ELECTRO-PLATER.

By GEORGE B. HOGABOOM.

Dr. Watts, in recently addressing an assemblage of electro-platers, remarked: "When information on such matters as these is available to those interested, your friends—the electro-chemists —will no longer spend months or even years in perfecting deposition from some particular electrolyte that could never be used in competition with present solutions on account of too great cost. Platers suffer no inconsiderable loss because of misdirected effort on the part of electro-chemists, who, from a lack of published information on the relative cost of the different operations necessary to plating, devote much of their time available for experiments in plating, to matters of trifling importance, or even entirely useless. I speak with some authority in this matter from sad experience." Those remarks are to the point and emphasize that what is needed is whole-hearted co-operation and wholesome criticism —for that alone will bring the electro-plater and the electro-chemist together.

The evolution of electro-plating solutions seems to have been divided into three distinct cycles—the complicated, the extremely simple, and the efficient. In the early days of the industry the construction of a solution was very complicated and little attention was given to the amount of metal deposited in a given time, or to either anode or cathode efficiency.

About five years ago, with the advent of rapid plating salts, the pendulum, like in so many other cases, swung to the other extreme, and the simple solution, one with a cyanide of the metal and an alkali cyanide, or, in the case of nickel deposition, a single nickel salt solution, was considered the only way to get a fast deposit; the speed mania had taken hold of the plating fraternity.

At the present time the pendulum is beginning to approach a more rational swing. The simple solution did not live up to its reputation, but it did do one thing, and that was to set the electro-plater to thinking. It was evident that the day of the complicated solution had passed—it was not efficient; the simple solution lacked some of the good qualities of the complicated one and now, at the present time, the electro-plater is entering into the third cycle and his quest is for an efficient electro-plating bath. How to obtain that is the one great unsolved problem and in its solution the services of "his friends—the electro-chemists" are of inestimable value, but they must have unreserved assistance from the electro-plater. They are "useless each without the other."

In collecting data for this paper 250 letters were sent to as many foreman platers, publicity was given in two periodicals, yet a discouragingly small number of answers were received. Not that there are no unsolved problems, but because the electro-plater has so far failed to realize the importance of electro-chemical research work. Some of the answers received were only problems of the individual—those of trying to duplicate some finish or overcome some local difficulty.

There is one way in which much assistance could be given the electro-plater aside from research work, and that is in giving him standardized electro-plating chemicals and general supplies.

While standardization is needed and some very valuable work is being done by the U. S. Bureau of Standards on electro-typing solutions, under the direction of Dr. Blum, nothing of a definite nature can be done with electro-plating solutions until they are studied in the same manner. The construction of the solutions that are now being used commercially must be known and also the value of the metallic and chemical salts, and the effect of the several addition agents.

A member of this society who is one of the foremost men in his line of electro-plating, submitted the following problems, which illustrate those of one branch of the industry:

1. To what extent is the nature of the electro-deposit influenced by the physical structure of the metallic base, such as steel, copper, brass, Britannia, German silver, etc.?

2. What is the best cleansing process to use on buffed German silver flatware, to produce 100 per cent perfect plating?

3. *Ditto* on steel and hollow-handle table cutlery?

4. What is the best method of obtaining a smooth adherent silver deposit upon perfectly cleansed German silver flatware?

(*a*) By placing directly in silver strike?

(*b*) By use of mercury dip followed by silver strike?

(*c*) Striking in nickel bath followed by silver strike?

5. What is the best method of obtaining smooth adherent silver deposit upon steel and hollow-handle table cutlery? Is it best to strike the silver on direct, or place in nickel bath and strike with silver afterward?

6. What composition of silver bath will produce the most efficient deposit, viz., most smooth and rapid, upon German silver flatware, hollow ware, deposit work, table cutlery?

What is the highest current density that can be used in this bath to obtain smooth deposit at 65 degrees F. (19 degrees C.) and what agitation is best?

7. What simple, rapid and convenient method is there for determining the amount of nickel and free acid in the nickel bath?

8. What simple method is there for determining the cause of nickel solutions working dark or otherwise unsatisfactory? What is the remedy?

9. How can the rusting of silver-plated table cutlery, while in use, be prevented?

10. What causes silverware to "spot out" before it reaches the consumer?

Problem 1 is most interesting in that it opens up a field of thought to which very little attention has been paid. We know of some work that has been done along that line which has proved beyond doubt that the character of the deposit is materially affected by the structure of the metal receiving the deposit. Especially is this true of steel and German silver.

In problem 7 a question is asked which the electro-chemist on first thought would answer by saying that it would be a simple

matter to titrate a nickel-plating solution for the free acid present. We know of no indicator that will give a good end point in the volumetric determination of the free sulphuric acid using a regular standard soda solution for titration. Of all the books upon electroplating which give the method of analysis for nickel-plating solutions, Langbein alone speaks of the estimation of the free sulphuric acid.

In the bath recommended by Mathers, Stuart and Sturdevant both boric acid and ammonium citrate are used in a solution containing both nickel sulphate and nickel ammonium sulphate. If the bath is to be kept constant in metal and free acid how shall the plater proceed to analyze it?

Problem 10 not only applies to silver-plated articles but also to brass, copper and bronze-plated objects. Much work has been done in trying to solve the "spotting out" problem but it is still with us. We have seen work baked out, boiled out, given alternate dips in hot and cold water to remove the occluded salts, neutralizing solutions used, plating in cyanide of potassium instead of cyanide of sodium and vice versa, and, at times felt confident of success only to find on the following day the same attack of "measles" even under the protective coating of lacquer.

The pitting of nickel deposits is another problem to which the electro-plater has given much thought without being able to find a remedy. We disagree entirely with Mathers, Stuart and Sturdevant that pitting is caused "by the adherence of loosened insoluble particles of anode or other hard material." * * * And that "The buffing pulls these adhering particles away, leaving holes in the nickel." Such holes have never before been considered as "pitting," and the authors fail to distinguish between a rough and a pitted deposit. Pitting occurs upon smooth adherent deposits that color up easily on the buff, and there is no evidence of "holes" in the deposit. It may and very probably is caused by the adherence of gas bubbles, and contrary to the same authors, has, in a measure, been prevented by agitating the solution with air or keeping the cathode in motion. If a bath is agitated, however, the sludge will cause rough deposits and unless pure nickel anodes are used iron, with which nickel anodes are alloyed, will be deposited with the nickel. If a small enough current or voltage was used the efficiency of the bath would be greatly decreased and another exception, pitting, occurs more often in baths slightly acid than in those which are almost neutral.

Bennett, Kenny and Dugliss, in their experiments with nickel solutions, found that "The best deposits are obtained when the solution is alkaline at the surface of the cathode" and "The efficiency is dependent upon the degree of alkalinity of the cathode film." It is too bad that the subject of "pitting" was not thought of in those experiments, for we believe that the cause would have been determined. It is probable that "pitting" is caused by the primary deposition of hydrogen at the cathode and, if there was an alkaline film at the cathode, that would be prevented and the nickel be deposited primarily instead. In that case there would be no gas bubbles on the cathode and consequently no "pitting."

Other problems submitted were:

11. How can nickel deposits be made to adhere firmly to tin or tinned articles?

There is no difficulty in depositing nickel upon tin so that it will stand buffing, but if the deposit becomes broken it can be peeled off in strips very easily. The condition is true of imported nickel-plated tinware as well as domestic.

12. What are the factors controlling the hardness or stiffness of copper deposit? It is well known that this is dependent upon the rate of deposit, amount of free acid in the bath, temperature, impurities, etc. Why is the deposit hard or soft? The hardness is not essentially accompanied by either fine or coarse-grained deposits. The problem is to get a hard deposit independently of the rate of deposit and at will.

13. A practical solution for the deposition of chromium is greatly desired. Chromium deposits are less susceptible to the action of the air and moisture than nickel and therefore tarnish less easily.

14. A positive rust-proof coating, black in color, for iron and steel, without the use of excessive heat.

15. A dip to produce a brass coating on iron and steel by simple immersion, similar to a copper dip.

16. Why will a single nickel salt solution plate zebra-like black and white streaks when the work is given a mechanical motion during the deposition while it plates very satisfactory, white and smooth, when used as a "still" solution?

17. A substitute for platinum chloride to produce the same color effect upon silver. Platinum black is the only durable and satisfactory color for "oxidized" and "French gray" finishes at the present time.

18. Arsenious acid added to a cyanide brass solution brightens the deposit. It also materially decreases the efficiency of the bath. It is well known that the presence of arsenic in copper wire injures its conductivity. Does it affect the deposition of copper from a brass solution in the same manner?e

19. If a cyanide copper solution is made from an alkali cyanide, cyanide of copper and a small amount of soda ash, the anode efficiency cannot be maintained at 100 per cent unless the free cyanide content is kept at such a point that a slight decrease in the metal content will cause blistering of the deposit. What salt can be added that will corrode the anode, producing a compound that will be easily soluble in the free cyanide, and thereby keep the anode clear? Bisulphate of soda is recommended by Roseleur, Langbein, Barclay and Hainsworth and other writers on electroplating. That salt decomposes the free cyanide and decreases the cathode efficiency. Large amounts will result in only a slight film of copper being deposited. Watts recommends bi-tartrate of potassium, which is very expensive and would increase the cost of production. Miller advises aqua ammonia, the effect of which is soon lost in a hot solution.

20. A successful cyanide of zinc solution, one in which there

would be a fairly good anode corrosion so that the bath could be kept uniform in metal content.

21. A plating rack or a covering for one that would not be coated with metal except at the points of contact with the articles to be electro-plated. Tons upon tons of metal are deposited upon racks every year which must be refined at a heavy expense or be sold as scrap metal.

22. A satisfactory solution for the deposition of a true bronze, i. e., copper and tin. Fields recommends a double ammonium oxalate solution. In experimenting with this solution Mathers found that at "first such a bath gives a rough copper, then a bright copper and then a bronze which gradually becomes whiter until it is as white as tin." He was unable to maintain conditions required for a rich uniform bronze.

23. A brass solution from which the metal can be deposited as efficiently as copper can be from an alkali cyanide bath and not be coarse or brittle. One in which the anode efficiency will approximately 100 per cent without the addition of large amounts of aqua ammonia or any ammonium salts which either quickly decompose or decrease the cathode efficiency.

24. What is the comparative value of cyanide of potassium and cyanide of sodium in relation to the corrosion of the anode, solubility of the compound formed at the anode, and conductivity, in the commercial electro-plating solutions generally used?

In conclusion I wish to thank those who assisted me in trying to catalogue some of the unsolved problems of the electro-plater.

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## WHO AM I?

I am more powerful than the combined armies of the world.

I have destroyed more men than all the wars of the nations.

I am more deadly than bullets, and I have wrecked more homes than the mightiest of siege guns.

I steal, in the United States alone, over $300,000,000 each year.

I spare no one, and I find my victims among the rich and poor alike, the young and old, the strong and weak. Widows and orphans know me.

I loom up to such proportions that I cast my shadow over every field of labor, from the turning of the grindstone to the moving of every railroad train.

I massacre thousands of wage-earners in a year.

I lurk in unseen places, and do most of my work silently. You are warned against me, but you heed not.

I am relentless.

I am everywhere—in the home, on the streets, in the factory, at railroad crossings, and on the sea.

I bring sickness, degradation and death, and yet few seek to avoid me.

I destroy, crush or maim; I give nothing, but take all.

I am your worst enemy.

I am CARELESSNESS.—Courtesy Southern Pacific Co.

# WHAT THE BRANCHES ARE DOING

## CLEVELAND BRANCH.

*Meets once a month at American House. Secretary, Charles Werft, 1775 East Sixty-eighth Street, Cleveland.*

A special meeting was held on April 22nd at the American House to consider plans for inviting and holding the 1916 Convention in Cleveland at the Hotel Statler on July 6th, 7th and 8th. Secretary Werft read a paper on "Duplex Copper," which was so interesting all present took part in the general discussion.

Cleveland Branch votes for Mr. TerDoest's paper for their choice of papers presented at the Dayton Convention.

The invitation to entertain the Convention having been promptly accepted, the Convention Committee, of which H. J. TerDoest, 59 Bowery street, Akron, Ohio, is chairman, made their plans known and it will be taken care of similar to the plan of the Dayton Convention. Inasmuch as each delegate and visitor will contribute a portion toward the expenses, a registration fee for entire Convention will be $3.00, which includes banquet; and to manufacturers and others who only attend the banquet the charge will be $1.75 per plate.

Space for exhibits will be provided at the hotel and will be gratis. Exhibits should be shipped to American Electro-Platers' Society, care of Hotel Statler.

Hotel Statler is located at Euclid avenue and East Twelfth street; has 1,000 rooms and 1,000 baths; rates from $1.50 per day up. It is advisable to make reservations.

We ask a hearty co-operation of all members of the A. E. S.

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## ST. LOUIS BRANCH.

*Meets third Saturday of each month at Public Library Assembly Rooms. Secretary, F. C. Rushton, 4405 Blair Avenue, St. Louis, Mo.*

The St. Louis Branch entertained its members on April 15th to a supper and theater party, meeting at the Laclede Hotel for supper, after which we adjourned to one of the parlors for a short meeting, the rest of the evening being spent at the Columbia Theatre. Everyone enjoyed themselves thoroughly.

It was decided to hold meetings on the third instead of the fourth Saturday of the month, in the future, that date being more convenient to the majority.

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## TOLEDO BRANCH.

*Meets the last Tuesday of each month at Toledo University. Secretary, James E. Nagle, 209 Navarre Ave., Toledo, Ohio.*

Our class in chemistry has continued throughout the year, meeting two nights a week. This takes so much of our time we don't have any papers or discussions, but expect in the near future to see some published from Toledo.

## TORONTO BRANCH.

*Meets fourth Tuesday of each month at Occident Hall, Bathurst and Queen Streets. Secretary, Ernest Coles, P. O. Box 5, Coleman P. O., Toronto, Ont.*

The regular meeting of the Toronto Branch was held on Thursday, March 23rd, with President Salmon in the chair. Routine business was carried out with dispatch, the members being intent on a thorough discussion of the papers read at the Dayton Convention, which has evidently caused a record attendance. The various papers were read out by the Librarian and discussed thoroughly and impartially and a unanimous vote recorded in favor of the paper entitled "The Commercial Aspects of the Electro-Deposition of Cobalt," by W. S. Barrowes, as the paper of most interest and benefit to the knowledge of the electro-deposition of metals.

A communication from the United States Bureau of Standards, seeking information in reference to the work of the Branch, was referred to the Laboratory Committee.

Toronto, Can., May 7, 1916.

The regular meeting of Toronto Branch was held on Thursday, April 27th, with President Salmon presiding over an excellent attendance.

Notice from the Supreme Secretary, that the 1916 Convention had been awarded to Cleveland Branch, was received; and, there being no further business for it, the Toronto Committee was discharged.

The nomination of officers for the coming year took place and showed the majority of the present ones in line for re-election.

The question box contained the following paper: (1) What causes a brass solution to give a reddish deposit, and what change has taken place in the solution to bring about this condition and from what cause? (2) What is the name of the white substance which corrodes on a brass anodes, and what causes the corrosion to occur? (3) What addition to the brass bath will maintain a clean anode surface?

This paper was discussed at length by all present and, while proving to be both interesting and instructing, was another example of the lack of unanimity of opinion on plating matters.

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## PHILADELPHIA BRANCH.

*Meets first Friday of each month in the Harrison Laboratory Building, University of Pennsylvania, 34th and Spruce Streets Secretary, Philip Uhl, 2432 North 29th Street, Philadelphia.*

The regular monthly meeting of Philadelphia Branch was held Friday, May 5th, with a good number present. Dr. Lukens gave an interesting talk on the different sulphurets as oxidizing agents.

The following officers were elected for the coming year: President, Wm. J. Bell; Vice-President, Otto W. Mott; Secretary and Treasurer, Philip Uhl; Trustees, E. T. Homan, Samuel Barr, C. V. Bayer; Librarian, Chas. Stein; Representative to Convention, Philip Uhl; Alternate, Samuel Barr.

## NEW YORK BRANCH.

*Meets second and fourth Friday of each month at Room 714, No. 32 Union Square, New York City, 8 p. m. Secretary, Wm. Fischer, 345 East Twenty-third street, New York City.*

The time of our last meeting was taken up packing preparatory to moving to our new place.

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## PROVIDENCE BRANCH.

*Meets second and fourth Wednesday of each month at No. 60 Weybosset Street. Secretary, Albert J. Lemrise, 124 Waverly Street, Providence, R. I.*

Our Branch met April 19th. The meeting was opened by the President, who called on the committee for a report, which was read by the Vice-President and accepted.

The minutes for the last two meetings were read and approved. A bill to the Supreme Secretary was presented to the Branch and ordered paid. The increase in membership was next discussed. It was decided to announce same in the local papers. A change was made in the date of meetings, which are to be held, in the future, the second and fourth Wednesday of each month at No. 60 Weybosset street.

Mr. Charles H. Proctor's lecture on the economy of copper cyanide in divers solutions was next read, and discussed by the members, the President and Mr. J. Andrews taking a very prominent part in it.

The Treasurer and Librarian presented the Branch with a set of recording books and with the temporary Charter nicely framed. The President thanked both for the gift in the name of our Branch. The meeting then adjourned to May 10, 1916.

I am sorry to state that in my first communication I overlooked to inform you of the very prominent part Mr. Nelson Barnard, Secretary for the Bridgeport Branch, took in the organization here. All the necessary information was obtained through his kindness, and I wish that the Society should know how well Bridgeport is represented in their Secretary.

We thank you once more for your kindness and good wishes.

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## DETROIT BRANCH.

*Meets first Tuesday of each month at 26 East Congress Street. Secretary, B. E. Miller, 543 Townsend Avenue, Detroit, Mich.*

The regular May meeting was held on Tuesday, May 2nd, with an attendance of 17.

After the regular order of business, the nomination and election of officers for the coming year resulted as follows: H. S. Brockway, President; E. W. Woodmansee, Vice-President; B. E. Miller, Secretary and Treasurer; A. J. Fritz, Sergeant-at-Arms; E. G. Sovering, Librarian; C. S. Tompkins, E. W. Woodmansee, Geo. Kutzen, Board of Managers.

## MILWAUKEE BRANCH.

*Meets first Friday of each month at West Side Bank Building, Third and Chestnut Streets. Secretary, E. C. Yaeger, 962 Ninth Street, Milwaukee, Wis.*

At our regular meeting held on May 5th the following officers were elected for coming fiscal year: President, Jos. Birnbaum; Vice-President, Ed. Wiman; Secretary, E. C. Yeager; Treasurer; Treasurer, Andrew Kraft; Librarian, Dan Wittig.

It was decided to hold an open meeting the first Friday in June for the purpose of securing more members. Managers and superintendents of factories having plating departments will be invited, and, as we expect to have a very successful meeting, we invite members from other branches to attend. This will be held at our regular meeting place, the West Side Bank Building, Third and Chestnut streets.

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## DAYTON BRANCH.

*Meets first Wednesday of each month at the Y. M. C. A., Dayton, Ohio, Secretary, Alphonz Lamourcux, 500 East First Street, Dayton, Ohio.*

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## BRIDGEPORT.

*Meets third Friday of each month at the office of the Brass World, 260 John Street, Bridgeport, Conn. Secretary, Nelson Barnard, 858 Howard Ave., Bridgeport, Conn.*

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## INDIANAPOLIS BRANCH.

*Meets second Saturday of each month at Hotel Dennison. Secretary, Louis Mertz, 1725 Union Street, Indianapolis, Ind.*

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## CHICAGO.

*Meets fourth Saturday of each month, 8 p. m., Western Building, Randolph Street and Michigan Avenue. Secretary, H. E Willmore, 5911 South Boulevard, Chicago, Ill.*

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## ROCHESTER.

*Meets second and fourth Friday of each month at University of Rochester. Secretary, C. V. Haring, 603 Dewey Avenue, Ro-*

*Secretary, F. H. Nordmann, 720 Froom Ave., Cincinnati, Ohio.*

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## NEWARK BRANCH.

*Meets first and third Friday of each month, 8 p. m., 47 Bank Street, Newark, N. J. Secretary, Geo. Reuter, Jr., 333 S. 19th*

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## BUFFALO.

*Meets first Saturday of each month at the University of Buffalo, 8 p. m. Secretary, John G. Murphy, 71 Dingens St., Buffalo, N. Y. Street, Newark, N. J.*

## ELECTED TO MEMBERSHIP.

BRIDGEPORT BRANCH.

Mr. James F. Spaine.....391 Catharine St., Bridgeport, Conn.
Mr. John E. Morse.....518 Ferry St., New Haven, Conn.

PHILADELPHIA BRANCH.

Mr. Christian E. Brubaker.....635 Walnut St., Columbia, Pa.

PROVIDENCE BRANCH.

Mr. Andrew M. McQueeny.....20 Nichols St., Providence, R. I.
Mr. Wm. Parks, Jr.....49 Second Ave., Edgewood, R. I.
Mr. Gavin J. Tyndall.....Care Geo. M. Claflin Co., Attleboro, Mass.
Mr. E. K. Morgan.....9 Washington Ave., Arlington, R. I.

TORONTO BRANCH.

Mr. Ray Williams.....478 Roncesvalles Ave., Toronto, Ont.
Mr. Wm. Jaffray.....70 Jackman Ave., Toronto, Ont.

ST. LOUIS BRANCH.

Mr. M. A. Bell (Associate).....4141 St. Louis Ave., St. Louis, Mo.

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## APPLICATIONS FOR MEMBERSHIP.

NEW YORK BRANCH.

Mr. John Loeffer.....310 South St., West Hoboken, N.J.
Mr. Joseph Oswald.....392 East 158th St., New York, N. Y.
Mr. Harry Maynard.....354 Twenty-first St., Brooklyn, N. Y.

ROCHESTER BRANCH.

Mr. Chas. H. Dunnaven.....36 Warwick Ave., Rochester, N. Y.

CLEVELAND BRANCH.

Mr. A. K. Schultz.....1649 East Thirty-eighth St., Cleveland, O.

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## CHANGE OF ADDRESS.

Mr. James Wooldridge.....1142 Bloor St. West, Toronto, Ont.
Mr. Thos. G. O'Keefe.....23 Roxborough St., Toronto, Ont.
Mr. Philip J. Cooper.....107 Concord Ave., Toronto, Ont.
Mr. Martin Smith.....1443 North Fifth St., Philadelphia, Pa.
Mr. H. H. Williams (after June 1st)—
4156 Botanical Ave., St. Louis, Mo.

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I'm not going to worry any more. I've hired a professional worrier to do it for me. His salary is $500 a month.

"Where are you going to get the money to pay him?"

"That's the first thing he'll have to worry about."

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Satan uses various baits for the industrious, but he can catch the idle with the bare hook.

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There is good in all men, but some are so stingy about letting it come out.

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# NOTICE.

## THE 1916 CONVENTION WILL BE HELD AT CLEVELAND, OHIO.

Whi'e some of us are disappointed at not having the opportunity of visiting the Queen City of our neighbor land and to enjoy the hospitality of our Toronto friends, we now look with happy anticipation toward a visit to the so-called "Forest City." Cleveland was noted for the many shaded drives and beautiful streets it had close to its business center, and while these have partly disappeared, owing to the growth of the city, necessitating the use of more thoroughfares to handle the traffic of a great manufacturing city, yet other features, such as parks, parkways, and bouelvards come to the rescue of the name.

Cleveland, by the 1910 census, was rated as the sixth city in the United States, but is now engaged in a hand to hand struggle with St. Louis (take note, Mr. Editor) for fourth place honors in 1920; this fact speaks well for the enterprising men of the city, some of whom will be our hosts at the coming annual convention of the A. E. S., on July 6th, 7th and 8th, and while we gather together to further the interests of our society, the program will take up most of our time, but yet with such opportunities as we may have, we are sure to visit many points of unusual interest.

Edgewater park, on the west side, and Gordon park, on the east side of the city, both fronting on Lake Erie, have fine bathing beaches, which afford plenty of room for bathing, without rocking the boat (ask Richards). The drive along the boulevard through Rockefeller and Wade parks, Ambler, Euclid and Shaker Heights to Woodland Hills and Garfield parks, and then to the Zoo at Brookside park, in the south end, to see "Minnie," the elephant, is very interesting.

Euclid Beach park, several miles east on the lake front, is reached by car, and is strictly first class, in fact, more so than many of the high-class amusement resorts.

In regard to industries, very few cities can rival Cleveland as to the variety and size of its manufacturing establishments. The new group plan of its public buildings, and the new high level bridge over the Cuyahoga river and valley, will attract visitors.

Cleveland is a popular city in most respects, the friendliness and activity of its people being so apparent that it has manifested itself even in the ranks of the A. E. S., and then not only in members of the Cleveland branch, but by former residents, now members of other branches, among whom we might mention Geo. B. Hogaboom, past president; H. H. Williams, first vice president; Fred J. Siscomb, Chas. Gaylord and C. F. Athy. There are several others whom the writer is unable to name now.

Remember, all roads lead to Cleveland for foremen electroplaters the 5th of July.

By H. H. Williams, a Former Resident.